

# Publishable result-oriented report



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Compiled by Kaija Saramäki, NKUAS

With contributions from

Simo Paukkunen, NKUAS, Simon A. Booth, UREADSE, UK, Sabine Putz, SOLID, Austria, Nikolay Vangelov, ERATO, Bulgaria, Veljko Vorkapic, EIHP, Croatia, Hrvoje Hucika, HEP ESCo, Croatia, Philippa Hughes and Louise Simmonds, TVE, UK, Wolfgang Hiegl, WIP, Germany, Georgios Markogiannakis and Argyro Giakoumi, CRES, Greece, Antonio Pantaleo, Chiara Candelise and Alessandro Leucci, MedEnerg, Italy, Mauro Bertini, CS, Italy, Paola Miglietta, UNI, Italy



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## List of abbreviations

BioSolESCO	Biomass and/or Solar ESCo
CA ESD	Concerted Action for the Energy Services Directive
CDM	Clean Development Mechanism
ECM	Energy Conservation Measures
EPBD	Energy Performance Building Directive
EPC	Energy Performance Contracting
ESCO	Energy Saving Company
ESD	Energy Service Directive
EU	European Union
IEE	Intelligent Energy Europe
JI	Joint Implementation
M&V	Monitoring and Verification
NKUAS	North Karelia University of Applied Sciences
NTA	Netherlands Technical Agreements
PPPs	Public Private Partnerships
RES	Renewable Energy Sources
RETs	Renewable-energy and Energy-efficient Technologies
ST-ESCOs	Solar Thermal Energy Service Companies
TPF	Third Party Financing
VAT	Value Added Tax
WhCs	White Certificates

## 1 Project description

Energy service companies (ESCOs) are emerging as a new approach to increase rate of uptake of biomass and solar heat projects in larger buildings in public and private sectors. ESCOs offer a complete package, from design, finance and installation through to operation including maintenance and fuel supply.

This project aim was to expand the use of biomass and solar heat in both public and private sectors via:

- Detailed understanding of ESCOs approaches and promoting this new knowledge to EU biomass heat and solar thermal industries and potential adopters.
- State-of-the-art exemplar energy services implementation – biomass heat, solar heat or biomass+solar – with host organisations at chosen sites in participating Member States.

The consortium brought together the leading experts in the field plus several actual ESCOs. Partners are commercial companies, energy agencies, consultancies, universities and a local authority. These organisations are well placed to actively participate in the establishment of exemplar ESCOs within each participating Member State. The project analysed and demonstrated solutions to non-technical hurdles faced by ESCOs.

Results are widely useful throughout EU27. Eight Member States participate – Austria, Bulgaria, Croatia, Germany, Greece, Finland, Italy and UK. These are wide-ranging and representative for Europe so results will have widespread applicability.

An up-to-date, comprehensive review of the current status of ESCOs throughout the EU27 provides new knowledge on these approaches – similarities, how successful, how widespread etc. Detailed data is collected and analysed on ESCo investment

models, financial performance, organisation structure and contracts. These issues are central to ESCo business models but there is virtually no information available on these. A number of tools have been published including descriptive models, financial spreadsheet tools, outline and sample contracts.

The bulk of the work was to actually establish exemplar ESCo schemes within the eight Member States. This took place in two phases. In phase 1, specific sites were identified, feasibility studies done, covering technical, financial and commercial issues, and stakeholders consulted. In phase 2, ESCo opportunities were developed to the point prior to implementation (point of “no return”) and this included forming consortium, releasing tenders for contractors as necessary, drawing up contracts, seeking financial investment. Unfortunately this part of the project did not realise as hoped mainly due to economic and political reasons.

This project includes a comprehensive package of activities to disseminate results to target audiences: ESCos; manufacturers and installers; entrepreneurs; public sector organisations; energy agencies; utilities. It is anticipated that the body of knowledge including the flagship ESCo schemes created by this project will have highly significant roll-on impacts by mobilising these stakeholders.

The project consortium and their expertise are as follows:

- North Karelia University of Applied Sciences, **NKUAS**’ main tasks are education and training in different fields, including environmental technology and forestry. Bioenergy, small scale entrepreneurship and pellets are one of its core research and development activities.
- University of Reading School of Business, **UREADSE** is a research intensive university and is an expert in efficient conversion, distribution and use of energy, among others.
- S.O.L.I.D. GmbH, **SOLID** is specialised in large scale solar plants of over 500m<sup>2</sup> offering solutions from planning to execution. Solid is also engaged in ESCo operations.

- Erato Holding Plc, **ERATO** is a Bulgarian energy service company offering energy efficiency and RES project implementation to both the private and the public sectors.
- Energy Institute Hrvoje Pozar, **EIHP** is a central scientific institution in planning and implementing the energy sector reform in Croatia.
- **HEP ESCo** is engaged in the development, implementation and financing of energy efficiency projects and has performed energy efficiency measures in for example buildings, industry and street lighting.
- Thames Valley Energy Ltd, **TVE**'s missions are to educate, promote and deliver sustainable energy projects working closely with local communities. TVE's expertise covers a number of different renewable energy sources.
- WIP Munchen, **WIP**'s activities include, among others, analytical research work on energy issues, formulation of strategies for the integration of renewable energy technologies and high-level event management for European conferences, workshops and campaigns.
- Centre for Renewable Energy Sources, **CRES** is the Greek national entity for the promotion of renewable energy sources, rational use of energy and energy conservation
- Mediterranea Energia, **MedEnerg** offers solutions for energy cost savings, energy efficiency and renewable energy sources. Its clients include communities, energy operators and industrial operators.
- Costruzioni Solari Srl, **CS** works in the solar energy sector and offers design and production as well as r&d services in solar energy.
- Uniconfort SpA, **Uni** expertise is in the field of thermal technology and of the solutions for the energetic conversion of pellets and biomasses coming from agriculture, the wood working industry and forestry.

## 2 Terms and Definitions

**Energy Service Company (ESCO):** a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria;

**Energy Performance Contracting (EPC):** a contractual arrangement between the beneficiary and the provider (normally an ESCo) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement;

**Third-Party Financing (TPF):** a contractual arrangement involving a third party — in addition to the energy supplier and the beneficiary of the energy efficiency improvement measure — that provides the capital for that measure and charges the beneficiary a fee equivalent to a part of the energy savings achieved as a result of the energy efficiency improvement measure. That third party may or may not be an ESCo;

**BioSoIESCo:** can be characterized, an ESCo that implements projects in the area of biomass and/or solar applications. The project may also include energy efficiency measures in order to achieve better savings and become this way economically more attractive. Few are the pure biomass and/or solar ESCo projects. In most of the cases the projects are energy supply contracts which can be characterized as ESCo projects.

**Heat entrepreneurship:** Heat entrepreneurship in Finland is the dominating form of companies of individuals to supply heat to customers. Heat entrepreneurship in its most common form is supplying heat to one or many customers by one entrepreneur, a group of entrepreneurs or a cooperative, The heat is most often made from forest biomass, such as pellets or wood chips. The business model used in the heat



entrepreneurship companies varies, and has different forms. Currently (2009) there are approximately 380 heat plants operated by heat entrepreneurs in Finland.

## **4 ESCo framework in EU27 and Croatia**

An overview of the ESCo market in the EU27 and Croatia shows that the markets are very variable and the state of development varies from highly developed markets to undeveloped ESCo markets. The ESD provides some legal background for the ESCo schemes and will hopefully unify the understanding of ESCos. Financial issues, such as banking and subsidies vary across Europe and the contracts available for ESCos are versatile and no common format is used.

### **4.1 Legal background for TPF and ESCos**

A general review of the ESCo markets of the European Member States demonstrates that diversity exists among the countries in what concerns the ESCo market development, structure and regulations. In some countries (e.g. UK, IE, GR, FI, PT) at least up until now, there is no particular legal format for ESCos, and the constitution can be any of the recognised formats in the country's law. Also there are no particular rules relating to the provision of private finance of ESCos, other than those that apply to borrowing and contracts generally. For example in UK and Ireland, where this case applies, it is suggested that Private Limited Company would be the most appropriate vehicle for most ESCos as it is the most flexible.

With the Energy Service Directive – ESD (2006/32/EC), which was deposited upon all EU member states in 2006, the lack of specific legislative framework of the energy service market is expected to change, and this way the operation of ESCos will be clarified and the energy service market will be helped to move forward and develop. The ESD, which should have been transposed into national legislation by all member states by May 2008, aims to a cost effective improvement of energy efficiency in end-use by indicating target values, removal of market barriers, and stimulation of the energy service market. As reported in December 2008 7 member states had communicated full transposition of the ESD into national legislation, 11 member states had communicated partial transposition while 9 member states had not communicated at all.

In some of the countries where the energy service market is already developed the terms ESCos and energy services are not necessarily used. For example in France the terms "energy service" and "Energy Service Company", which are common in Europe, appeared in the country only in late 1990s thanks to the liberalization of energy markets and due to the development of the Energy Service Directive and the subsequent debates. Also in Germany the term ESCo is hardly used. Instead, this business model is referred to as Contracting. In order to prevent confusion concerning the terms describing contracting, the DIN 8930-5 "Contracting" (2003) defines the basic terms, several alternative contracting schemes, service components, pricing for services, application areas and the legal background.

One of the most important legislative restrictions that impeded the ESCo activity in the public sector in many of the European Member States was the fact that operation and particularly purchase of equipment, as well as provision of services including energy services in the public sector was not allowed to be designated to private entities. It has long been claimed by ESCos that the engagement of the private sector to provide complex solutions for the public sector would be beneficial and could deliver innovative solutions. This issue has been partly solved almost in all the EU countries (e.g. FR, IT, DE, U.K, IE, GR, SI, SP, PT, CY, RO, SK) and Croatia when legislation on Public Private Partnerships (PPPs) has been established. Of course the level of PPPs adoption and the sectors these agreements can cover differentiate a lot among member states. PPP is a sort of "umbrella notion" covering a broad range of agreements between public institutions and the private sector aimed at operating public infrastructures or delivering public services [19]. In what concerns the implementation of ESCo projects in the public sector, under these special and formal agreements, multi-year concession contracting regarding the installation, operation and maintenance of leased/outsourced energy efficient equipment in public buildings can theoretically be realized. The PPPs allow the public sector to pay the private company's remuneration periodically during the project, and allows that payment being based on performance indicators previously set out in the contract (instead of being purely revenue based). In order to further increase the effectiveness of this regulation, public accounting rules should also be revised and the separation

of operation and investment budgets should be overcome in case of ESCo projects, where it is very important that the savings in operation budgets could be used as a levy for investments in energy efficiency. Moreover, public procurement rules should be revised to allow including energy performance criteria.

In the Baltic countries (Latvia, Estonia, Lithuania) unstable and not well defined regulatory frameworks as well as unfavourable procurement procedures contribute to slowing the initialisation of market growth. In Poland public procurement procedures hamper the selection of best bids and are not suitable for long-term contracts; Decision processes and financial procedures within public bodies are too complicated; Since ESCo schemes and contracts are rather complicated, laws regulating specifically contracting services would help to overcome basic insecurities. Furthermore, public procurement processes should be adapted in order to open this market to ESCo services.

In Croatian legislation, ESCo model is mentioned in Act on energy efficiency in direct consumption (OG 152/08). The act defines an ESCo and states that funds for energy services are ensured by contractor, i.e. ESCo, entirely or partially, from own sources or third parties, that contractor or a third party bears risks partially or entirely and that energy service is repaid through savings. Moreover, the Act formulates energy efficiency contract which has to include information on things such as the energy service client, third party financing, if there is any participating, primary energy consumption, guaranteed energy savings etc.

There is a procedure for insurance schemes to be incorporated in the ESCo project and also insurance of equipment is regulated by a contract with a producer/provider of equipment who guarantees for the equipment installed. As payment security instruments, HEP ESCO, currently the only ESCo in Croatia, uses different instruments depending on the type of the client. Type and number of instruments used depend on the evaluation of a client solvency.

## **4.2 Existing contracts**

There are several schemes for ESCo or ESCo-like operations in Europe and they vary in their principles. EPC and TPF are well known schemes and include both energy production and energy saving mechanisms. Country specific schemes, such as a heat supply contracts and chauffage contracts are used in Finland and France for example.

- **Plant / Operation contracting;** The plant/operation contracting (*Energieliefercontracting* - Energy supply contracting) is the most commonly used ESCo scheme in Germany. In this scheme the contractor plans, finances and constructs the new heat production equipment or takes over the existing system. The contract duration is typically 10-20 years and the contractor is responsible for the operation, maintenance and attendance. The contractor buys the energy and sells the heat to the client. Energy savings are included in the scheme but in the form of efficiency as the new equipment is more efficient. Usually no other energy efficiency measures are implemented. The cost structure for the plant/operation contracting includes a basic price to cover the contractor's investment costs (including loan repayment) and plant maintenance. The other part of the payment is for the actual energy consumption.
- **Energy Performance Contracting (EPC);** is used at least in Germany (*Einsparcontracting*), Italy, Bulgaria, Latvia and Finland (*Energiapalvelusopimus*). EPC's can have either shared or guaranteed savings and includes energy efficiency measures such as additional insulation, adjustment of equipment, etc.
- **Chauffage contract;** these contracts include operations without specific energy efficiency measures. The contractor provides optimal operation of existing system and provides a certain, agreed level of comfort at a lower cost.

- **Heat entrepreneurship;** this is by far the most commonly used solution for ESCo-like operations in Finland. There are five basic business models for heat entrepreneurship;
  - Business model where the client owns the heat plant and the company only operates the heat plant. The client carries the whole investment risk. This is the most common heat business model in Finland.
  - Business model where the company both owns and operates the heat plant and supplies heat to the customer. The company carries the whole investment risk. This is coming more common business model in Finland.
  - Business model where a larger company owns the heat plant and the subsidiary (or private person) operates the heat plant. The big company carries the whole investment risk and the income of the subsidiary (or private person) is not very big.
  - ESCo – business model, not very common in Finland
  - Franchising – business model. Some companies have tried this business model in Finland, but they have not succeeded to create a real business.

### **4.3 Financial institutions and schemes**

ESCo project financing is a major issue in the development of ESCo markets in EU. The projects require funds to realize and only the larger ESCo companies have the capacity to fund the investments with their own existing funds. In countries where the ESCo market is not developed, well known or the companies are small the role of the financing institutions is crucial. In some countries the ESCo schemes are not familiar to the financing institutions and may hinder the development of ESCo markets as a whole.

The financing institutions need to consider the reliability of the client as well as the ESCo. Although private clients may be more attractive in terms of income and energy saving possibilities their solvency may be a risk. The ESCo's reliability can be

assessed from their references and number of previous projects but this in turn is a downside for new, emerging ESCos as they do not have track record of ESCo projects. The contract issues are difficult for the funding institutions to assess due to their variability and lack of one single contract model for ESCos. The price adjustments, ownership structures, risk management, etc. vary from contract to contract. If the bank has a chance to participate in the contract design it would be easier for them to assess and understand the contracts. The liability, warranty and insurance issues need to be assessed as well.

The technical know-how to heat production and/or energy efficiency may also prove to be difficult for the banks to understand and more information should be made available to the funding institutions.

In addition to third party financing there are other sources of funding available for ESCo operations. The schemes and mechanisms vary throughout Europe and can be from national or international sources. The most common forms are low-interest loans and subsidies. The focus is commonly on energy efficiency but in more increasing numbers also on the use of renewable energy sources.

## 5 Estimating ESCo profitability

A tool for assessing the profitability of an ESCo operation was made in the Bio-Sol-ESCO project. The tool is an Excel-sheet and it gives preliminary information to the customer whether and ESCo project is viable in their premises. The tool compares the costs of the current heating system and a new potential system run by an ESCo. An ESCo company can use the tool for calculating potential profit from an ESCo project. Understandably large ESCOs have their own methods for calculations but especially for new, emerging ESCo the tool is a good starting point for starting its operations. The tool gives the “big picture” of the ESCo operation and it does not give exact results or exact projections of profit. The tool and its manual have been written from the point of view of the client.

The minimum data needed for the tool are the annual amount of energy used, the price of the energy, interest rate and time period (contract period). Additional information, such as the annual change in the energy price or annual operational costs will give a more accurate estimation of the ESCo operations viability. The potential customer can find the annual amount of energy used and its price from invoices from the utility or landlord. The past trend of energy prices can provide an input for the projected annual change in energy prices. In some cases, the projected change can be found from media. A common interest rate in Europe is 4-5% and can be used for the calculations. The contract periods vary case to case and they also depend on the size of the investment. In general, the bigger the investment the longer the contract period. For renewing the heating system 10-20 years on average are used.

Data for the new heating system includes the amount of investment which can be estimated based on prior ESCo operations or heating system renewals in the region. This kind of data may be available from regional or local energy agencies or from the case examples of the Bio-Sol-ESCO project. More detailed investment costs can be obtained from manufacturers or installers of heating systems. In many countries there are grants and subsidies available for switching from fossil fuels to renewable

energy sources or for improving energy efficiency. The subsidies are generally administered by public authorities and the applicable rates may be found from the internet or directly from the authorities. For the new system, a lower amount of energy consumption can sometimes be used. As a result for a new boiler for example, the energy efficiency improves and thus reduces the amount of energy used for heating. If the investment costs include some structural changes to the building this can also lower the energy consumption. The residual value of the new system means the value of the equipment at the end of the contract period and can be estimated as a percentage of the original investment.

With the data input of the operation the tool will give the payback period of the investment and the annual fees of the new system or a notion that the investment in the new system is not profitable.

With the basic idea whether an ESCo operation is profitable for the customer and/or the ESCo the client can proceed to further discussions with a potential ESCo and other stakeholders.

## **6 Contractual issues**

The contract represents the agreement between the client and the ESCo on how the project will be organized, the judicial relationship between the client and the ESCo and it defines the roles of the parties involved. A good contract is flexible in order to protect the interests of both parties and to reflect the needs of the client. The two principal EPC's defining the relationships and risk allocations between the ESCo, client and lender are the shared saving contract and the guaranteed savings contract.

### **6.1 Shared savings model**

In this contract model the ESCo assumes both the performance and credit risk. The ESCo takes the loan for the investments and repays it with the payments by the client. The loan is normally collateralized with the expected savings payments. The guaranteed savings contract normally requires third party financing. The model may be difficult for ESCo with several operations as the ESCo may end up having too much loan versus equity.

The shared savings contracts are suitable for emerging ESCo markets as the client bears no financial risk. The ESCo profits may also be higher in this model due to the financing service it provide to the client.

### **6.2 Guaranteed savings model**

The guaranteed savings contract requires an established banking structure and a high degree of familiarity of project financing as well as technical expertise in the banking sector. As the client assumes the risk of loan repayment the concept is difficult to apply in developing countries. On the other hand, the guaranteed savings contracts provide a platform for new ESCos to enter the market. The client would be responsible for the loan and the ESCo guarantees the savings.

### **6.3 Other contract models**

The energy supply contracting contracts in Germany, “chauffage” contracts in France and Italy and the heat supply contracts in Finland vary in their contents and the contracts. In most cases, the contractor plans, finances and constructs the new heat production system (or takes over an existing system) and operates and maintains the plant for the contract period, typically 10-20 years. The investment capital can be obtained by the client or the ESCo or jointly. The contractor buys primary energy in a way agreed in the contract and provides heat to the client as agreed. The comfort level, sources of energy etc can be agreed upon in the contract. The contractor has the opportunity to increase its profits by installing more energy efficient equipment or purchasing cheaper fuel (if allowed by the contract).

The financing institution together with the ESCo can form a Single Purpose Entity for the production of heat and/or implementation of energy efficiency measures. These are not commonly used but may be a future option for ESCo projects.

### **6.4 Contents of the contract**

Whichever contract model is used, certain issues need to be addressed in the contract <sup>1</sup> to define the responsibilities and relationships of the agreeing parties and the principles of payment for the services.

- equipment ownership
  - who owns the equipment and does the ownership change during the contract period
- malfunction
  - who is responsible for repairs and possible damages caused by malfunctions, is there a fine for delayed repairs
- firm actions and damage
  - who is responsible for damages and their consequences

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<sup>1</sup> the list is not exhaustive and is not limited the mentioned issues

- equipment selection and installation
  - which kind of equipment is used (BAT, other, environmentally sound equipment, domestic equipment or imported, etc), procedures, who installs the equipment, schedule
- provisions for early termination
  - is early termination possible and at what cost, how does the ownership of equipment react to this
- conditions beyond the control of the parties
  - insurances for force majeure situations, liabilities, code of conduct in informing
- default language
  - in multilanguage countries especially or cross-border contracts, define the overriding language of the contract
- indemnification
  - compensation for loss or damage, insurances
- assignment
  - who does what and when
- savings calculations formulas
  - how are the savings calculated, at what intervals, which is the base year
- calculation of base year and adjusted baseline
  - what is included in the base year calculation (energy consumption, number of occupants, hours of operations, type of building, utility rates) and how is it adjusted (for example heating degree days, use of building, etc)
- measurement and verification
  - how is the energy consumption measured, are the meters calibrated, who measures the consumption
- energy prices
  - current prices, agreed energy price for the period of the contract, changes to the prices
- comfort standards
  - humidity, temperature, etc



- projected compensations and guarantees
  - what is the estimated cashflow and how much energy is estimated to be saved

## **7 Client selection**

From the ESCo's point of view the client selection is a critical issue for the success of the project. The client's ability to pay for the services as well its motivation for energy savings and efficiency affect the saving potential and the actual savings during the project.

### **7.1 Type of customer**

Public sector is generally thought to be a safer customer as their cash flow is steadier and the annual variations in the cash flows are smaller than in the private sector. Public sector rarely goes out of business unlike the private sector. The type of customer can also be classified based on the use of the building, for example residential housing, industrial or service building. The differences in the energy consumption, its distribution over day, month or year vary between the different types. Decision making in the public sector takes more time than in the private sector and may be less appealing for the ESCo. The private sector may be more motivated for energy efficiency measures than the public sector.

### **7.2 Motivation**

The motivation of the client improves the profitability of the ESCo project as it is more likely that the client puts effort into its everyday activities and energy consumption habits if they are motivated. Although the motivation increases the savings the ESCo projects should be restricted to highly motivated customers only. The less motivated clients who opt for a longer contract are just as good customers for the ESCo. The motivation of industrial clients may be lower due to their unwillingness to spend their scarce capital on investments outside their core business even if it would bring them savings in the long run.

### **7.3 Trust**

During the preliminary phase of assessing the viability and profitability of an ESCo project the ESCo spends its resources on the planning. In most cases, the time used for the planning is reimbursed by the client if the operation does not proceed to

implementation phase. The trust between the client and ESCo needs to be strong for the planning to go smoothly and that it would lead to a contract for implementation. The trust also implies that the client is willing to accept reasonable terms and conditions.

## **7.4 Top commitment**

The top management should support the ESCo operation and its objectives and act towards reaching its goals. The management's understanding of energy efficiency's impact on the company's or municipality's cost structure is crucial and they should see the ESCo operation as a long term investment (and commitment) and not as a quick fix. The management can show a good example to its staff and increase the positive attitude towards the measures taken. The lower level management can push the energy efficiency initiatives forward to the higher level especially in the municipal level.

In the residential sector the management of the housing companies has a great impact on the general perspective to the living habits and thus improves the uptake of energy efficient habits amongst the occupants. The commitment of the caretaking company also affects the habits of the occupants.

## **7.5 Staff commitment**

The management should appoint the people responsible for the ESCo operation in an early stage to ensure commitment and understanding of the operations requirements and benefits. The staff who are aware of the daily running and operation of the current heating system have tacit knowledge of the site and can help in the planning phase. The dedication and awareness of the whole staff can improve the profitability and the energy efficiency measures can be more easily integrated into the everyday actions of all staff members.

Residential occupants should be given enough information about the things affecting energy consumption in their building for them to be able to affect their habits. It helps,

if the actions can be expressed in monetary terms as in many cases the occupants pay for their own energy.

## **7.6 Project size**

The ESCo concept is rather complex and small projects are unattractive to the ESCos as the costs of the project implementation are larger than the project income. The financial institutions may also be vary of lending money to small projects as the risk of failure or less savings than anticipated may occur. ESCo operations can be joint so that several buildings in the same area are included in the same operation. For example a small district heating network can serve a number of buildings and clients and the size of the heating system and annual energy production is sufficient to attract ESCos.

## **7.7 Energy savings potential**

The energy saving potential is strongly linked to other criteria for client selection (project size, equipment, building age). The energy saving potential should not be the sole criteria because longer contracts with less energy saving potential are profitable as well. The energy saving potential should be considered versus the length of the contract. A large energy saving potential is appealing for both the client and the ESCo as the contract periods are shorter.

## **7.8 Energy consumption data**

Availability of energy consumption data is an advantage as the potential energy savings can be estimated in more detail and more accurately. Detailed energy consumption data (daily, monthly, annual, hot water/space heating, etc) for several years provides valuable information for the baseline. The numbers of customers or occupants etc bring deeper knowledge of the demand for energy. Variances in the historical data can be taken into account, for example if the factory has been shut down for several months or climatic conditions have varied or if improvements have been done to the building. The data is adjusted for the baseline consumption.

## **7.9 Equipment**

The information of the current equipment and the structural possibilities for new installations improve the estimation of the project implementation. The equipments' condition and age provide information on the current energy efficiency. The availability of space for biomass storage or solar collectors is also an important issue.

## **7.10 Building age**

Building age affects the calculations of the energy efficiency and potential energy consumption as there are certain characteristics in the building materials and methods in each era. The level of insulation, window types and heating systems are often age specific.

## **7.11 On-going maintenance**

The level of on-going maintenance is an indicator of the client's ability to take care of the building. If the current system has not been properly taken care of or there are other drawbacks in the maintenance and management of the system the ESCo needs to consider if they are able to maintain the new system at an adequate level.

## **7.12 Risk assessment**

The technical and financial risks need to be assessed by the ESCo before engaging in the project. The risk assessment includes for example assessing the motivation and payment capacity of the client. The ESCo needs to be prepared to withdraw from implementing the project if the risks seem too high or uncontrollable.

## **7.13 Creditworthiness**

The client's creditworthiness is an indication that the client is most likely to pay for the services provided. For new or small companies the creditworthiness may be difficult to assess as they may not have a track record of any credits or such. In this case



more emphasis is put on the risk assessment. Creditworthiness can also be assessed based on prior collaboration or by asking from other partners of the company.

### **7.14 Business prospect**

Companies that have been established a long time ago and have a number of year of operation with no major problems present a good client. These kinds of clients are likely to be in operation for the whole duration of the project. If the client's line of business is not seen as a future business opportunity the ESCo can consider if the client will be in operation in a few years time.

## 8 Feasibility studies

For assessing the possibility for an ESCO operation feasibility studies are needed. The feasibility studies investigate initial potential for energy savings and costs of an ESCo operation. The study can be used by both the client and the ESCo. The client can assess if the ESCo operation would be beneficial for them and the ESCo can assess whether the operation would be profitable. The feasibility study should include a number of issues for appropriate evaluation<sup>2</sup>:

- Basic information in client
  - name, company, line of business, city of operation, heating degree days of location
- Description of the building
  - usage of the building (residential, industrial, public/private, hotel, hospital, etc.)
  - dimensions, building area m<sup>2</sup>, height, building volume m<sup>3</sup>, etc
  - insulation and year of construction
- Number of occupants, beds, etc
  - occupants of residential building, number of beds of hospitals, hotels, etc
- Annual operating hours
  - different for industrial, domestic, public
  - change in heating needs in day/night, summer/winter, etc
- What is the objective of the client for ESCo operation
  - clients motivation for ESCo operation (high motivation means higher savings)
- Blueprints of the building(s)
  - for design of piping, boiler, solar collectors
  - north-south orientation
  - windows and doors, heat losses

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<sup>2</sup> The list is not exhaustive and is not limited to items listed

- Map of the estate
  - for design of heat production, storage and handling of fuel
  - solar installation
  - traffic planning
- Current energy source and price and billing
  - current source of energy (oil, coal, electricity, biomass, etc)
  - current price of above mentioned energy, price adjustments
  - current billing system (base tariff, peak load demand, etc)
- needed comfort level
  - desired indoor temperature
  - desired indoor humidity
- Current annual energy consumption
  - annual energy consumption/energy source in kWh or MWh
- Current annual consumption of hot water
  - in m<sup>3</sup>
- Storage tank size
  - in m<sup>3</sup>
- Circulation piping
  - is there a piping system installed or does it need to be installed
- existing hot water system
  - heating method, distribution method
- amount of fuel used
  - annual amount of different fuels used

The feasibility study investigates the current technology and searches for alternative methods of energy production and for increasing energy efficiency. The client's motivation for energy efficiency and savings is essential. If the client is not motivated to change its habits the savings may not realise as planned.

In the Bio-Sol-ESCO project each partner country published a call for potential ESCo clients. The partners decided how the calls were published and internet, newspapers and emails were used for publishing the calls. The number of replies varied between the partners and the criteria for selection of potential sites included the potential for energy savings,



amount of current energy consumption/m<sup>3</sup> and the client's motivation and willingness for new technical innovations. Each partner performed at least one feasibility study for a potential ESCo operation. The studies serve as examples as to what the studies are like and how the profitability can be assessed. The studies also include cost data of current costs and potential future costs with the ESCo operation and without the ESCO operation. As the Bio-Sol- ESCo partners are spread around Europe the feasibility studies provide a broad view to the potentials of ESCo operations. The climatic conditions and the construction styles differ in the countries and are taken into account in the feasibility studies.

The stakeholders can be consulted during the feasibility studies. Stakeholders in the ESCo projects include (for example) the financing institutions, planning officials, public organisations, manufacturers and installators of equipment, neighbours and utilities.

## **9 ESCo selection**

A good, reliable ESCo has certain qualities and the client needs to consider a number of things in connection with these. It must be said that new, emerging ESCo may not fulfil all the criteria or they may be difficult to assess.

### **9.1 Experience**

A reliable ESCo has a track record of successful projects. If possible, the client can ask to contact some previous customers of the ESCo to discuss the ESCo's performance. It is beneficial if the ESCo has worked in the same sector earlier as the understanding of the specific issues is better this way. Previous experience of similar projects may also bring an insight to possible problems in the applications.

### **9.2 Operating stability**

The ESCo should have a sufficient amount of staff to perform all its duties regarding existing and future clients. If the ESCo is understaffed it may lead to delays in project implementation and design. Its financial stability is an important issue especially if the ESCo finances the project.

### **9.3 ESCo expertise**

The technical expertise of the ESCo is needed to realise new, innovative solutions designed specifically for the client. The ESCo should be able to propose new technologies, fuels and services suitable for the client. The client may not be aware of the technologies and other issues concerning the building and ESCo project and technical expertise brings the options to the attention of the client. The expertise should include technical, financial, legal and other issues.

## **9.4 Financing**

Well established ESCOs usually have good contacts to banks and other financial institutions. If the client is not so well known the ESCo's reputation may be a leverage point in getting the financing for the project. ESCOs also know about the current subsidies and are able to provide help in applying for them. The subsidies may be applied for by the client or ESCo, depending on the scheme.

## **9.5 Reliability**

Reliability of the ESCo means that the ESCo communicates in an open and transparent way. This includes informing the client of both positive and negative issues of the project without delay. The schedules of the design, implementation etc. should be fixed and respected. The attitude towards the client and the sector as a whole as well as the project should be professional. Offering additional services such as training and maintenance support show that the ESCo is committed to the client.

## **9.6 Services needed**

The mix of services agreed upon are decided between the client and the ESCo. The ESCo proposes a number of services to the client based on the objectives defined by the client at the beginning of the project planning. Comfort level, system maintenance and staff training for example can be offered and it is up to the client to decide which services are necessary and which can be executed by the client itself or are not needed at all. Services such as energy audits and monitoring and verification can sometimes be done by own staff or by other external experts.

## **9.7 Savings**

The ESCo needs to be clear on how baseline energy consumption is calculated and how future savings are calculated. The information should be made available to the customer in a way that is comprehensive and understandable. The conditions for

changing the savings prospect are agreed on and the things that may affect the baseline conditions in the future are explained.

## **9.8 Competitive bidding**

If the ESCo market is developed there are several ESCos in the market. If this is the case, competitive bidding can be used to compare and evaluate the possible services of ESCos. Unfortunately in many cases there is only one ESCo in operation. Especially in small ESCo projects competitive bidding may be impossible as the project is not attracting bids. The process takes more time than direct procurement of services but in the public sector is often the only allowed way for procurement. Competitive bidding should not use the price as its only criteria.

## 11 Key findings of the project

During the project a large number of stakeholders and other instances involved in different ESCo operations or related activities were consulted and the project consortium categorized the key findings of the project as governmental, market, customer and financial issues. They may be overlapping in some parts.

- Governmental/public issues
  - The public sector would be a good client but the decision making processes are sometimes too slow for effective implementation
  - lack of knowledge slows the uptake of biomass and/or solar ESCos in the public sector
  - there are no energy agencies or such with specialised knowledge of ESCos
  
- Market issues (including operational issues)
  - necessity for certification of ESCo projects
  - too much confusion with definitions
  - economic feasibility of solar thermal projects require a minimum of 500m<sup>2</sup> of collector area
  - existing competitors (in fossil fuel sector for example) at local level are very strong
  - scarcity of skilled installers
  - there are no markets for biomass fuels in some countries
  - big variations within Europe
  - competition between private and social enterprises and public bodies
  - ESCos in niche role in some countries
  - tax schemes for biomass commodities create market distortion
  
- customer issues
  - scalability of projects in certain conditions
  - lack of knowledge

- competition
- confusions about definitions
  
- financial issues
  - lack of capital
  - support schemes are not mature enough for efficient execution for ESCo projects
  - solarthermal ESCos are not viable without subsidies
  - lack of financing instruments for ESCos
  - access to capital

## 12 Lessons learnt

Based on the key findings the main lessons learnt are:

- lack of focus on know-how transfer
  - for example in Germany the market was developed already and does not require general information about ESCos. Instead it would need know-how transfer to transform and broaden the existing knowledge in the country
  
- leap from an ESCo to a biomass ESCo easy
  - if the ESCo market is developed and knowledge of the concept is known then the transformation to a biomass is easy
  - in undeveloped ESCo markets the ESCo concept can start with a biomass ESCo
  
- authorities work slow
  - public bodies are slow to react to changes
  - decision making processes are long and may result in unwillingness of the ESCos to engage in operations with the public sector
  
- project time short for realizing projects
  - the Bio-Sol-ESCO project time was too short to design and implement projects
  - reasons include the financial crisis but also the fact that new concepts take time to be understood well enough
  
- political support is weak
  - political support to ESCo activities is weak and slows the uptake of biomass and/or solar ESCos
  
- why have European countries learnt so slowly instead of acting

- decision making in the EU is slow and actions are not taken rapidly enough
- in other countries there may be more rapid changes in the structures of companies as they tend to act instead of waiting for political decisions and obligations
- customers and companies know little about ESCos
  - the publications of this project will contribute towards this
  - the potential clients and ESCos have no means for informed decision making if there is no information about ESCo schemes available
- resistance from brown energy providers exist
  - a regulatory change is needed to favour green energy

## 13 Policy recommendations

Policy recommendations from the project were grouped into policy recommendations concerning the public sector, information about ESCOs in general and financial issues.

The **public sector** (national, regional or local) is a key to developing the ESCo market. The public bodies should set up demonstration projects to show the effects and impacts of ESCo operations. The projects would be open for public to visit and the information from the planning phase all the way to the implementation and operation phase would be public. Information should include the procurement process, technical details and the cost information (investment and operating costs) and the savings should be clearly presented. As the companies and other potential clients would see how an ESCo operates, it may increase its interest towards an ESCo project of their own. Some of the public ESCo projects may be implemented as a result of some obligations for the public bodies to reduce their CO<sub>2</sub> emissions or increase the use of renewable energy sources and also in this case the information should be made publicly available. Capacity building is needed in the public sector for greater awareness of ESCo potentials in the public sector. Decision making processes in the public sector should be more flexible and the sole criteria of price should not be used in energy production procurement processes.

Sufficient, easy enough **information** is not widely available in Europe for potential clients or new Bio-Sol-ESCOs to receive information about the concept. In addition to information provided in projects such as the Bio-Sol-ESCO project, information about social aspects, affects to the landscape and emissions should be distributed. Best practice cases should be presented to the public as well as the public sector to attract interest.

ESCO **financing** at the moment is very confusing for clients and ESCOs to easily understand. Subsidies, loans and interest benefits are difficult to find and they change rapidly. Tax reductions should be used for use of renewable energy sources



to make the change from fossil fuels to renewable fuels more appealing. The subsidies should be linked to the energy savings and efficiency and not only the use of renewable energy sources for greater impact. The cost structure of ESCos should be taken into account in EU structural funds and similar.

## 14 Conclusions

It is acknowledged in many political notions that ESCos are an important tool for reducing carbon emissions and for reducing the use of energy. Yet there are limited mechanisms for utilising ESCos in their best potential. Knowledge is readily available for potential clients and new emerging ESCos to get acquainted with the topic and hence there is little demand for ESCos. Increasing the knowledge of ESCo projects, their financing, their operation policies, technologies and (as an important issue to the client) the financial benefits, will increase the uptake of ESCos. The use of bioenergy or solar thermal energy in the applications can be implemented. The need for demonstration projects is evident and the public bodies should take initiative in setting up projects to demonstrate the applicability of ESCos.

A mix of knowledge transfer to clients and ESCos, public involvement in ESCo projects and clear legislation and policy is needed to boost the ESCo market. The project activities show that once there is adequate knowledge and guidance in ESCo related issues the potential clients will be more open to consider the possibility of ESCos. In Greece, for example, a Memorandum of understanding has been signed for the ESCo operation as a result of the project and in Croatia an ESCo project was set up during the project life. Other projects are under consideration based on the feasibility studies done in the project and this shows that the need for knowledge is evident.

The financial aspects are difficult for regular people to understand and the tool designed in the project will help to assess the feasibility of the operation. The tool is used already by operating ESCo companies.

The project publications available on the website can and will be used for dissemination of ESCo issues throughout Europe and hopefully it will create positive interest in ESCo activities. The publications are informative and have examples from the partner countries. The examples show different approaches to the technologies,



financing, project design and management and will provide an insight to the versatility of ESCo projects.

More information is needed for the greater public as well as the public bodies in order to increase the uptake of Bio-Sol-ESCos. Clear regulations and financing possibilities for implementation will ease the barriers of using ESCos as service providers.

## 15 EACI contact person and project team

At the Executive Agency for Competitiveness and Innovations (EACI):

Mr. Emilio Font de Mora, Project Officer, [emilio.fontdemora@ec.europa.eu](mailto:emilio.fontdemora@ec.europa.eu)

Mr. Michael Fernandes-Cordeiro, Financial Officer, [michael.fernandes-cordeiro@ec.europa.eu](mailto:michael.fernandes-cordeiro@ec.europa.eu)

The project consortium:

NKUAS, Ms. Kaija Saramäki, [kaija.saramaki@pkamk.fi](mailto:kaija.saramaki@pkamk.fi)

UREADSE, Dr. Simon Booth, [s.a.booth@reading.ac.uk](mailto:s.a.booth@reading.ac.uk)

SOLID, Ms. Sabine Putz, [s.putz@solid.at](mailto:s.putz@solid.at)

ERATO, Mr. Nikolay Vangelov, [n.vangelov@erato.bg](mailto:n.vangelov@erato.bg)

EIHP, Mr. Veljko Vorkapic, [vworkapic@eihp.hr](mailto:vworkapic@eihp.hr)

HEP ESCo, Mr. Hrvoje Hucika, [hrvoje.hucika@hep.hr](mailto:hrvoje.hucika@hep.hr)

TVE, Mr. Keith Richards, [keith.richards@tvenergy.org](mailto:keith.richards@tvenergy.org)

WIP, Mr. Wolfgang Hiegl, [wolfgang.hiegl@wip-munich.de](mailto:wolfgang.hiegl@wip-munich.de)

CRES, Mr. Georgios Markogiannakis, [gmarko@cres.gr](mailto:gmarko@cres.gr)

MedEnerg, Mr. Antonio Pantaleo, [pantaleo.antonio@gmail.com](mailto:pantaleo.antonio@gmail.com)

CS, Ms. Paola Miglietta, [c.s@costruzionisolari.it](mailto:c.s@costruzionisolari.it)

UNI, Mr. Geremia Silvio, [germia.silvio@uniconfort.com](mailto:germia.silvio@uniconfort.com)

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